

Exelon Utilities Program AM-EU-P034 Rev. 3

Effective: Supersedes: Review Type: 3/19/2021 AM-ED-P034 NERC

Core Function:

Preventive Maintenance

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1. Purpose

To provide guidelines for development, documentation, implementation, and oversight of an effective preventive (PM) and predictive (PdM) maintenance program for the electric transmission, substation, and distribution assets.

2. Precautions and limitations

2.1. Precautions

2.1.1 This document contains specific content that has been or will be used as "Evidence of Compliance" for regulatory audits. Any person(s) making revisions to this document shall contact the Exelon NERC Compliance and Security NERC Compliance Management Team (NERC CMT) to inform them of proposed revisions (Outlook address: Exelon NERC CMT O&P Compliance).



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- **2.1.2** A representative of the NERC CMT shall be included as a "reviewer" of any proposed revisions to this document.
- **2.1.3** This document relates to North American Electric Reliability Corporation (NERC) Standards listed below:
 - **2.1.3.1** PRC-005 Protection System, Automatic Reclosing, and Sudden Pressure Relaying Maintenance
 - **2.1.3.2** PRC-008 Implementation & Documentation of Under Frequency Load Shedding (UFLS) Equipment Maintenance Program
 - **2.1.3.3** PRC-011 Under Voltage Load Shedding (UVLS) System Maintenance & Testing
 - 2.1.3.4 PRC-017 Remedial Action Scheme Maintenance and Testing
- **2.1.4** ComEd Only: Determination of the NERC status of NERC Protection System Equipment (NPSE) shall follow the process as prescribed in AM-CE-P134 (*Protection System Equipment*).
- 2.1.5 Responsibilities prescribed by this process may be performed by designees; however, responsibility for the task remains under the purview of the identified role(s). See Section 5 for roles and responsibilities.
- 2.1.6 If ReliabilityFirst (RF) requests documentation associated with this preventative and predictive maintenance program and its implementation, the information will be provided to RF and NERC within 30 calendar days.
- 2.1.7 Individual(s) conducting Preventive Maintenance at an Exelon facility impacted by NERC CIP standards shall adhere to Exelon's NERC CIP Cyber Security Policy.

2.2. Limitations

- 2.2.1 Protection System Maintenance programs are documented as required to meet NERC standards. This documentation will supersede the Maintenance Template Method once a maintenance program is declared implemented for each Protection System Component Type.
- **2.2.2** NERC CIP Vulnerability Assessments shall adhere to the NERC CIP Vulnerability Assessment Process.



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3. Prerequisites

3.1. There are no prerequisites.

4. Program

- **4.1.** Maintenance Templates will be used to document the required tasks and frequencies for the Preventive and Predictive Maintenance program.
- **4.2.** Budgetary estimates shall be developed to align with the template requirements. Budgetary estimates shall include details relative to resource requirements.
- **4.3.** The long-range work plan will reflect the budgetary estimates. Following finalization of the budget, the long-range work plan will be updated to reflect any necessary changes. The work plan will be levelized as required to support available resources. FEG requirements will be taken into consideration as the plan is developed.
- **4.4.** Procedures will be developed as required to support execution of the program tasks as identified in the Maintenance Templates. Document requirements will be identified by the appropriate field organization. Document development is the responsibility of the appropriate field organization.
 - **NOTE:** Procedure requirements should be determined based on the skill of the craft, complexity of the task being performed, and repeatability of the task. Determination of the Level procedure required is also necessary.
- **4.5.** Training of field forces needs to be performed as required to address skill gaps within the craft relative to program requirements. A well-defined and executed training program is necessary to ensure that the craft is proficient in executing tasks as required.
 - **NOTE:** As program requirements change there is a need to evaluate the potential for added craft training. Determination of the training requirements requires alignment with the field organizations.
- **4.6.** Model work orders will be used to define the requirements for tasks within the program. PMRQ's will be created for each component relative to the model work orders. Work orders will be generated in Asset Suite or equivalent electronic database to define the program requirements.
 - **NOTE:** For tasks initiated out of Cascade, the Cascade procedure type will be used to define the requirements. This information will be passed to Asset Suite.
- **4.7.** Work packages are to be prepared as required to execute the Cascade/Asset Suite work orders. The work planning process is addressed in the Work Planning Procedure.



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- **4.8.** Work tasks are to be scheduled per the Work Week Preparation of the Work Control Schedule procedure, where applicable.
- **4.9.** Work execution is per the Work Execution and Close Out process.
 - **4.9.1** For all equipment within the scope of NERC CIP standards:
 - **4.9.1.1** Changes made to the NERC CIP-010 baseline configuration as part of Preventive Maintenance shall adhere to the NERC CIP Configuration Control and Change Management Process.
 - **4.9.1.1.1** If Corrective Maintenance to applicable NERC CIP equipment emerges during performance of Preventive Maintenance, the individual identifying a need for Corrective Maintenance must contact the Operational Compliance Owner (OCO).
 - 4.9.1.2 An individual identifying a change to a security control that is inconsistent with Exelon practice or an unauthorized change to NERC CIP-010 baseline configuration as part of Preventive Maintenance activity shall contact appropriate business unit Operational Compliance Owner (OCO) to initiate, as required, the Cyber Security Incident Response Program and the NERC CIP Recovery Program.
- **4.10.** Upon completion of a PM and/or PdM work order, the work order is to be completed in Cascade/Asset Suite or equivalent electronic database. Close out comments relative to the scope of work performed, conditions found, and Corrective Maintenance work orders generated are to be included in the work order completion comments.
- **4.11.** Corrective Maintenance work orders are to be generated as required to address as found conditions identified during execution of the PM and PdM program tasks.
- **4.12.** All inspection and test results (paper and/or electronic in format) shall be returned to a repository. This data will be used to fully understand a components maintenance history and current health. This information can be used for future trending.

5. Roles and Responsibilities

- 5.1. Key Managers
 - **5.1.1** Directors, Managers and their direct report supervisors shall be responsible for the day-to-day implementation of the Maintenance Program.
 - **5.1.2** Provide sponsorship and clear expectations for the consistent adherence to maintenance policies and procedures.
 - **5.1.3** Ensure that all personnel are trained to perform their assigned responsibilities.
- **5.2.** Area Maintenance or Field Engineer
 - **5.2.1** Provides input into the maintenance program relative to equipment health and effectiveness of tasks.



- **5.2.2** Evaluates component equipment health.
- **5.2.3** Reviews PdM test results as required.
- **5.2.4** Serves as primary interface to field forces for support during maintenance.
- **5.3.** Engineering and/or Asset Management
 - **5.3.1** Prescribes the preventive and predictive maintenance program task requirements for transmission, substation, and distribution system components and/or systems.
 - **NOTE:** Vegetation control programs are developed under Vegetation Management.
 - **5.3.2** Documents maintenance program requirements (tasks, frequencies) via Maintenance Templates.
 - **5.3.3** Ensures adherence to Maintenance Templates by performing periodic audit of maintenance program requirements (tasks, frequencies) in Cascade/Asset Suite.
 - **5.3.4** Ensures that Original Equipment Manufacturer (OEM) recommendations are considered when developing program requirements.
 - **5.3.5** Ensures that appropriate experts review proposed template modifications.
 - 5.3.6 Obtains Nuclear Station Engineering agreement on any changes prior to implementation in the preventive/predictive maintenance for all switchyard components included in the Nuclear Station NRC Maintenance Rule including changes such as: PM creation, PM cancellation, PM deferral and justification, and PM frequency change. This is per interface procedures WC-AA-8000 and WC-AA-8003, NERC Standard NUC-001, Requirement R9.3.2, and Nuclear Station NPIRs, Section 5.
 - **5.3.7** Monitors program performance and evaluates need to modify program requirements due to increased failure trends and/or emergent failure modes.
 - **5.3.8** Ensures that regulatory commitments are met relative to completion of program.
 - **5.3.9** Ensures that affected working departments review proposed Maintenance Template modifications for impact on work procedures.
 - **5.3.10** Generates Cascade/Asset Suite work orders as required to ensure program tasks are identified for inclusion in the work plan.
 - **5.3.11** Identifies annual budgetary requirements necessary to support program execution per template.
 - **5.3.12** Communicates program changes to stakeholders as needed.
 - **5.3.13** Provides input to maintenance programs regarding failure modes and necessary tasks to prevent failures. Investigates new technology.



- **5.3.14** Determines specific maintenance trigger levels as applicable to the equipment. Examples: acceptable oil quality and DGA limits; acceptable power-factor test results; thermography temperature limits.
- **5.3.15** Serves as the primary interface with Original Equipment Manufacturer (OEM).
- **5.3.16** Provides support to the field relative to equipment expertise and may supplement skill of the craft.
- **5.4.** Training Department
 - **5.4.1** Evaluates the need to develop training when preventive and predictive maintenance tasks change.
 - **5.4.2** Develops appropriate training program.
 - **5.4.3** Conducts training programs as required.
- **5.5.** Transmission and Substation / Construction and Maintenance / Distribution System Operations
 - **5.5.1** Executes the preventive maintenance program.
 - **5.5.2** Documents completion of program via work orders in the system of record.
 - **5.5.3** Ensures that close out comments in the system of record reflect work completed and meet the criteria set forth in the Work Execution and Close Out process.
 - **5.5.4** Ensures that questionable or unacceptable PdM or PM test results are reviewed and/or acted upon.
 - **5.5.5** Ensures that either Corrective Maintenance work requests or work orders are generated as required based on results of PdM and PM programs.
 - **5.5.6** Interfaces with Training to ensure that necessary training is approved and that skill of the craft is sufficient to perform program tasks.
 - **5.5.7** Ensures that procedure needs are identified and developed to support field execution of maintenance tasks.
 - **5.5.8** Ensures that changes to work procedures are reviewed by Engineering for alignment with Maintenance Templates and Asset Suite model work orders.
 - **5.5.9** Ensures that documentation relative to predictive and preventive maintenance tasks test results is stored and is available for future reference. Also ensures that physical maintenance logs and checklists are retained per the current record retention policy as described in Exhibit A of Corporate Procedure LE-AC-401, "Records Management, Retention and Disposition".
 - **5.5.10** Reports mapping discrepancies using the Document Discrepancy Process.
- **5.6.** Vegetation Management
 - **5.6.1** Responsible for the development, documentation, budgetary development, etc. for maintenance programs relative to Vegetation Management.



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- **5.7.** Work Management
 - **5.7.1** Evaluates resource requirements for maintenance program.
 - **5.7.2** Develops long-range work plan.
 - **5.7.3** Develops resource strategy to ensure execution of the plan.
- **5.8.** Work Planner
 - **5.8.1** Development and maintenance of model work orders for preventive and predictive maintenance tasks.
 - **5.8.2** Prepares necessary work packages in support of preventive and predictive maintenance.
- **5.9.** Work Scheduler / Responsible Manager
 - **5.9.1** Ensures that maintenance tasks are scheduled such that the grace period is not exceeded.
 - **5.9.2** Schedules work to align with FEG when required.
 - **5.9.3** Bundles work as needed to ensure completion of the program tasks.
- **5.10.** Operation Compliance Officer (OCO)
 - **5.10.1** Ensures compliance at the Business Unit or Shared Services level for NERC CIP standards.
 - 5.10.2 Single Point of Contact (SPOC) for field personnel if suspected deviations from the NERC CIP baseline configuration are identified during Preventive Maintenance.

6. Documentation

- **6.1.** Documentation generated during performance of this document shall be filed in accordance with Exelon Corporate Procedure LE-AC-401 Records and Information Management Retention and Disposition.
- **6.2.** Completion of the PM program is documented in the system of record.
- **6.3.** Predictive maintenance test results are to be captured and stored in Cascade to the extent that Cascade has been implemented.
- **6.4.** Hardcopy test results are to be stored.

7. Terms and Definitions

7.1. <u>Document Discrepancy Process</u> - The process for notifying the responsible mapping department of discrepancies that exist between the established as-built field condition and the current maps and drawings depicting that condition.



- **7.2.** Functional Equipment Group (FEG) Operationally integrated equipment that can be removed from service as a system to allow for efficient bundling of work activities. Typically, a family of components common to a clearance order boundary.
- **7.3.** Grace Period The grace period is an authorized amount of time allowed beyond a prescribed due date. The grace timeframe is typically the lesser of 25% of the task performance interval or 4 years. This timeframe is provided to allow for scheduling efficiency in support of an equipment outage schedule or cycle plan/ FEG bundling opportunities.
- **7.4.** <u>Inspection</u> Failure finding task visually performed on a scheduled periodicity. Also used to review the operating condition of components and gather required data to assess the condition of equipment.
- **7.5.** <u>Inventory</u> Population of preventive and predictive program tasks tracked via Cascade/Asset Suite. Inventory size is one of the indicators of the potential health of the preventative and predictive maintenance systems.
- **7.6.** Maintenance Template Identifies the preventive and predictive maintenance tasks recommended for a component or system. Maintenance tasks and frequencies are based on the criticality of the component, its duty cycle, and the environment in which it operates.
- **7.7.** Model Work Order Pre-planned templates used to create work orders for repetitive work or to generate Preventive Maintenance Work Orders.
- 7.8. NRC Maintenance Rule "NRC Maintenance Rule" shall mean the NRC rules and regulations set forth in 10CFR50.65, as they may be amended from time to time. 10CFR50.65 provides the NRC requirements for monitoring the effectiveness of maintenance at Nuclear Power Plants. The Maintenance Rule requires the licensee to monitor the performance or condition of structures, systems, or components (SSCs) against licensee established goals in a manner sufficient to provide reasonable assurance that such SSCs are capable of fulfilling their intended function.
- **7.9.** Overdue Preventive or predictive maintenance tasks that exceed their grace period.
- **7.10.** Past Due Preventative or predictive maintenance tasks that have gone beyond the prescribed due date.
- 7.11. Predictive Maintenance (PdM) Predictive Maintenance tasks are inspections and diagnostics activities. Examples of such tasks include, but are not limited to, infrared thermography, insulating oil sampling, acoustic monitoring, travel timing tests, system or equipment performance tests, visual inspections, and operational data reviews. PdM collected data is integrated and evaluated to make timely maintenance decisions in the form of corrective or preventive maintenance task execution, or preventative and predictive maintenance frequency performance adjustments.



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- 7.12. Preventive Maintenance (PM) Physical maintenance performed at set intervals with the intent of improving equipment material condition and thus preventing a component or sub-component performance failure. PM activities are preplanned and directed at preventing in-service failures. Normally, these activities are scheduled for performance at set frequencies (i.e. time directed), but may also be initiated based upon a specific event or system equipment condition. Examples: calibration of transformer gauges, circuit breaker temperature gauges and lubrication of mechanisms are Preventive Maintenance.
- 7.13. Work Order (WO) A Asset Suite document, which is a collection of tasks required to complete the desired work. It provides instructions for construction or maintenance work.
- **7.14.** Work Order Task One of a series of steps required to complete a Work Order.
- **7.15.** Work Request (WR) Asset Suite document of an Originator's request to have work performed.

8. References

- **8.1.** AM-CE-P134 Data Management for Protection & Control Equipment
- **8.2.** LE-AC-401 Records and Information Management Retention and Disposition
- **8.3.** LE-AC-401 Exhibit A Exelon Records Retention Schedule
- 8.4. NERC Reliability Standard NUC-001, Nuclear Plant Interface Coordination
- **8.5.** NERC Reliability Standard PRC-005, Protection System, Automatic Reclosing, and Sudden Pressure Relaying Maintenance
- **8.6.** NERC Reliability Standard PRC-008, Implementation and Documentation of Underfrequency Load Shedding Equipment Maintenance Program
- **8.7.** NERC Standard CIP-010, Cyber Security Configuration Change Management and Vulnerability Assessments
- **8.8.** NERC Reliability Standard PRC-011, Undervoltage Load Shedding System Maintenance and Testing
- **8.9.** NERC Reliability Standard PRC-017, Remedial Action Scheme Maintenance and Testing
- **8.10.** Memorandum of Understanding Between Exelon Nuclear And BGE/ComEd/PECO
- **8.11.** WC-AA-8000, Interface Procedure between BGE/ComEd/PECO and Exelon Generation (Nuclear/Power) for Construction and Maintenance Activities
- **8.12.** WC-AA-8003, Interface Procedure between BGE/ComEd/PECO and Exelon Generation (Nuclear/Power) for Design Engineering and Transmission Planning Activities



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- **8.13.** OP-AA-108-107-1002, Interface Procedure between BGE/ComEd/PECO and Exelon Generation (Nuclear/Power) for Transmission Operations
- **8.14.** WC-BR-8003-1000 Braidwood Station Units 1 and 2 Nuclear Plant Interface Requirements (NPIRs)
- **8.15.** WC-BY-8003-1001 Byron Station Units 1 and 2 Nuclear Plant Interface Requirements (NPIRs)
- **8.16.** WC-DR-8003-1003 Dresden Station Units 2 and 3 Nuclear Plant Interface Requirements (NPIRs)
- **8.17.** WC-LA-8003-1004 LaSalle County Station Units 1 and 2 Nuclear Plant Interface Requirements (NPIRs)
- **8.18.** WC-LG-8003-1005 Limerick Generating Station Units 1 and 2 Nuclear Plant Interface Requirements (NPIRs)
- **8.19.** WC-PB-8003-1007 Peach Bottom Station Units 2 and 3 Nuclear Plant Interface Requirements (NPIRs)
- **8.20.** WC-QC-8003-1008 Quad Cities Station Units 1 and 2 Nuclear Plant Interface Requirements (NPIRs)
- **8.21.** WC-CA-8003-1010 Calvert Cliffs Nuclear Power Plant Units 1 And 2 Nuclear Plant Interface Requirements (NPIRs)
- **8.22.** WM-EU-4001, Work Planning Procedure
- **8.23.** WM-EU-5001, Workweek Preparation of the Work Control Schedule
- 8.24. WM-EU-P020, Work Execution and Close Out
- 8.25. WM-EU-P029, EED Predefined Deferral Process
- 8.26. RC-AC-POL3-001, NERC CIP Cyber Security Policy
- **8.27.** RC-AC-PCS3-007, NERC CIP Configuration Control and Change Management Process
- **8.28.** RC-AC-PGM3-003, NERC CIP Cyber Security Training Program
- **8.29.** RC-AC-PGM3-005, NERC CIP Access Management Program
- **8.30.** RC-AC-PGM3-006, NERC CIP Recovery Program
- **8.31.** RC-AC-PGM3-009, Cyber Security Incident Response Program
- **8.32.** RC-AC-PCS3-011, NERC CIP Vulnerability Assessment Process

9. Attachments

9.1. N/A



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10. Development history

Revision 0		Date: 8/1/2014
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Reason written	Document rewritten for applicability to Exelon Utilities	

Revision 1		Date: 4/1/2016
Writer	Kevin Swiat, Material Condition – ComEd	
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Reason written	Revised for to ensure compliance with NERC CIP V5, Updated document references to most recent document number and title; Updated to reference Asset Suite.	



Revision 2		Date: 3/19/2018
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Reason written	Revised to ensure compliance with NERC two year review process and per AR 00474778-36. Updated document references to most recent document number and title; Removed references to Passport. NERC review complete.	

Revision 3		Date: 3/19/2021
Writer	Kevin Packer, T&S Engineering - PECO	
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Reason written	Added section 5.3.3. to align with recent AM-EU-P039 updates. Changed Material Condition to Asset Management in section 5.3. Removed PHI integration in progress disclaimer from the top of the document. NERC review complete.	